City of SACRAMENTO Fire Department

EMERGENCY RESPONDER RADIO SYSTEM (ERRS) COVERAGE

Purpose

The Sacramento Fire Department has prepared this policy to provide guidance to contractors, architects, business owners, consultants and the general public on local interpretations and practices that are considered to be in compliance with the 2019 California Fire Code (CFC). In accordance with CFC 2019 Section 510.4.2.2, the purpose is to provide specific technical information and requirements for emergency responder radio coverage systems in new buildings served by Sacramento City Public Safety Agencies. The intent is to clarify aspects of the code that are vague or non-specific by addressing selected issues under normal conditions. The requirements of this policy shall not be construed as altering any existing code, law or regulation which may require fire protection features not covered or alluded to in these requirements, nor shall they waive any requirements of any code, law or regulation. The reader is cautioned that the guidance detailed in this policy may or may not apply to their specific situation, and that the Sacramento Fire Department retains final authority to determine compliance.

Emergency responder radio coverage in new buildings.

New buildings shall have approved radio coverage for emergency responders within the building based on the existing coverage levels of the public safety communication systems utilized by the jurisdiction, measured at the exterior of the building. This section shall not require improvement of the existing public safety communication systems.

Exceptions:

1. Where approved by the building official and the fire code official, a wired communication system in accordance with CFC 2019 Section 907.2.12.2 shall be permitted to be installed or maintained instead of an approved radio coverage system.

2. Where it is determined by the fire code official that the radio coverage system is not needed.

3. In facilities where emergency responder radio coverage is required and such systems, components or equipment required could have a negative impact on the normal operations of that facility, the fire code official shall have the authority to accept an automatically activated emergency responder radio coverage system.

Requirements

Construction Permit (CFC 510.3)

A construction permit for the installation of or modification to emergency responder radio coverage systems and related equipment is required prior to installation. Construction documents and equipment data sheets shall be submitted to the Sacramento Fire Department and the Sacramento Building Department for review and approval. Maintenance performed in accordance with this code is not considered a modification and does not require a permit.

Minimum Qualifications of Personnel (CFC 510.5.2)

The minimum qualifications of the system designer and lead installation personnel shall include both of the following: 1. A valid FCC-issued general radio operators license. 2. Certification of in-building system training issued by a nationally recognized organization, school or a certificate issued by the manufacturer of the equipment being installed. These qualifications shall not be required where demonstration of adequate skills and experience satisfactory to the Fire Marshal is provided.

Technical Requirements

Systems, components and equipment required to provide the emergency responder radio coverage system shall comply with CFC 2019 Sections 510.4.1 through 510.4.2.8.

Emergency responder communication enhancement system signal strength. The building shall be considered to have acceptable emergency responder communications enhancement system coverage when signal strength measurements in 95 percent of all areas on each floor of the building meet the signal strength requirements in CFC 2019 Sections 510.4.1.1 through 510.4.1.3.

System design. The emergency responder radio coverage system shall be designed in accordance with CFC 2019 Sections 510.4.2.1 through 510.4.2.8, NFPA 1221, 70,and 72.

NFPA 1221 Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems

Amplification Systems Allowed. Buildings and structures that cannot support the required level of radio coverage shall be equipped with a radiating cable system, a distributed antenna system with Federal Communications Commission (FCC)-certified signal boosters, or other system approved by the Fire Marshal in order to achieve the required adequate radio coverage.

Standby Power. Emergency responder radio coverage systems shall be provided with dedicated standby batteries or provided with 2-hour standby batteries and connected to the facility generator power system in accordance with Section 1203. The standby power supply shall be capable of operating the emergency responder radio coverage system at 100-percent system capacity for a duration of not less than 12 hours.

Signal booster requirements. If used, signal boosters shall meet the following requirements:

1. All signal booster components shall be contained in a National Electrical Manufacturer's Association (NEMA) 4-type waterproof cabinet.

2. Battery systems used for the emergency power source shall be contained in a NEMA 3R or higher-rated cabinet.

3. Equipment shall have FCC or other radio licensing authority certification and be suitable for public safety use prior to installation.

4. Where a donor antenna exists, isolation shall be maintained between the donor antenna and all inside antennas to not less than 20dB greater than the system gain under all operating conditions.

5. Bi-Directional Amplifiers (BDAs) used in emergency responder radio coverage systems shall have oscillation prevention circuitry.

6. The installation of amplification systems or systems that operate on or provide the means to cause interference on any emergency responder radio coverage networks shall be coordinated and approved by the fire code official.

System monitoring. The emergency responder radio enhancement system shall be monitored by a listed fire alarm control unit, or where approved by the fire code official, shall sound an audible signal at a constantly attended on-site location.

Automatic supervisory signals shall include the following:

1. Loss of normal AC power supply.

2. System battery charger(s) failure.

3. Malfunction of the donor antenna(s).

4. Failure of active RF-emitting device(s).

5. Low-battery capacity at 70-percent reduction of operating capacity.

6. Failure of critical system components.

7. The communications link between the fire alarm system and the emergency responder radio enhancement system.

Additional Frequencies and Change of Frequencies. The emergency responder radio coverage system shall be capable of modification or expansion in the event frequency changes are required by the FCC or additional frequencies are made available by the FCC.

Installation Requirements (CFC 510.5 – 510.5.4) The installation of the emergency responder radio coverage system shall be in accordance with the following:

Acceptance Test Procedure. Where an emergency responder radio coverage system is required, and upon completion of installation, the building owner shall have the radio system tested to verify that two-way coverage on each floor of the building is not less than 95 percent. The test procedure shall be conducted as follows:

1. Each floor of the building shall be divided into a grid of 20 approximately equal test areas.

2. The test shall be conducted using a calibrated portable radio of the latest brand and model used by the agency talking through the agency's radio communications system or equipment approved by the fire code official.

3. Failure of more than one test area shall result in failure of the test.

4. In the event that two of the test areas fail the test, in order to be more statistically accurate, the floor shall be permitted to be divided into 40 equal test areas. Failure of not more than two nonadjacent test areas shall not result in failure of the test. If the system fails the 40-area test, the system shall be altered to meet the 95-percent coverage requirement.

5. A test location approximately in the center of each test area shall be selected for the test, with the radio enabled to verify two-way communications to and from the outside of the building through the public agency's radio communications system. Once the test location has been selected, that location shall represent the entire test area. Failure in the selected test location shall be considered to be a failure of that test area. Additional test locations shall not be permitted.

6. The gain values of all amplifiers shall be measured and the test measurement results shall be kept on file with the building owner so that the measurements can be verified during annual tests. In the event that the measurement results become lost, the building owner shall be required to rerun the acceptance test to reestablish the gain values.

7. As part of the installation, a spectrum analyzer or other suitable test equipment shall be utilized to ensure spurious oscillations are not being generated by the subject signal booster. This test shall be conducted at the time of installation and at subsequent annual inspections.

8. Systems incorporating Class B signal-booster devices or Class B broadband fiber remote devices shall be tested using two portable radios simultaneously conducting subjective voice quality checks. One portable radio shall be positioned not greater than 10 feet (3048 mm) from the indoor antenna. The second portable radio shall be positioned at a distance that represents the farthest distance from any indoor antenna. With both portable radios simultaneously keyed up on different frequencies within the same band, subjective audio testing shall be conducted and comply with DAQ levels as specified in Sections 510.4.1.1 and 510.4.1.2.

NFPA 72 Chapter 12 Circuits & Pathways – 12.4 Pathway Survivability. All system riser cables shall be in conduits and shall consist of one or more of the following:

1. Buildings where interior exit stairway and ramp enclosure are required to have fire-resistance rating of no less than two hours:
    - 2-hour fire-rated circuit integrity (CI) cable.
    - 2-hour fire-rated cable systems.
    - 2-hour fire-rated enclosure or protected area.
    - 2-hour performance alternative approved by the AHJ.

2. Buildings where interior exit stairway and ramp enclosure are required to have fire-resistance rating of no less than one hours:
    - 1-hour fire-rated circuit integrity (CI) cable.
    - 1-hour fire-rated cable systems.
    - 1-hour fire-rated enclosure or protected area.
    - 1-hour performance alternative approved by the AHJ.

NFPA 70 Article 728 Fire-Resistive Cable Systems. Fire-resistive cables, fire-resistive conductors, and components shall be tested and listed as a complete system, shall be designated for use in a specific fire-rated system, and shall not be interchangeable between systems. Fire-resistive cables, conductors, and components shall be approved.

Installations. Fire-resistive cable systems installed outside the fire-rated rooms that they serve, such as the electrical room or the fire pump room, shall comply with the requirements of 728.5(A) through (H) and all other installation instructions provided in the listing.

Mounting. The fire-resistive cable system shall be secured to the building structure in accordance with the listing and the manufacturer's installation instructions.

Supports. The fire-resistive system shall be supported in accordance with the listing and the manufacturer's installation instructions.

Raceways and Couplings. Where the fire-resistive system is listed to be installed in a raceway, the raceways enclosing the system, any couplings, and connectors shall be listed as part of the fire-rated system.

Cable Trays. Cable trays used as part of a fire-resistive system shall be listed as part of the fire-resistive system.

Boxes. Boxes or enclosures used as part of a fire-resistive system shall be listed as part of the fire-resistive system and shall be secured to the building structure independently of the raceways or cables listed in the system.

Pulling Lubricants. Fire-resistive cable systems installed in a raceway shall only use pulling lubricants listed as part of the fire-resistive cable system.

Vertical Supports. Cables and conductors installed in vertical raceways shall be supported in accordance with the listing of the fire-resistive cable system.

Splices. Only splices that are part of the listing for the fire-resistive cable system shall be used. Splices shall have manufacturer's installation instructions.

Grounding. Fire-resistive systems installed in a raceway requiring an equipment grounding conductor shall use the same fire-rated cable described in the system, unless alternative equipment grounding conductors are listed with the system. Any alternative equipment grounding conductor shall be marked with the system number. The system shall specify a permissible equipment grounding conductor. If not specified, the equipment grounding conductor shall be the same as the fire-rated cable described in the system.

Marking. System cables and conductors shall be surface marked with the suffix "FRR" (fire-resistive rating), along with the circuit integrity duration in hours, and with the system identifier.

Labeling. Provide signs on all doors providing access to ERRS stating "EMERGENCY RESPONDER RADIO SYSTEM EQUIPMENT INSIDE." Provide sign on donor antennas stating "EMERGENCY RESPONDER RADIO SYSTEM."

FCC Compliance. The emergency responder radio coverage system installation and components shall also comply with all applicable federal regulations including, but not limited to, FCC 47 CFR Part 90.219.

Maintenance (CFC 510.6 – 510.6.4) The emergency responder radio coverage system shall be maintained operational at all times in accordance with the following:

Testing and proof of compliance. The owner of the building or owner's authorized agent shall have the emergency responder radio coverage system shall be inspected and tested annually or where structural changes occur including additions or remodels that could materially change the original field performance tests. Testing shall consist of the following:

1. In-building coverage test as described in Section 510.5.3.

2. Signal boosters shall be tested to verify that the gain is the same as it was upon initial installation and acceptance or set to optimize the performance of the system.

3. Backup batteries and power supplies shall be tested under load of a period of 1 hour to verify that they will properly operate during an actual power outage. If within the 1-hour test period the battery exhibits symptoms of failure, the test shall be extended for additional 1-hour periods until the integrity of the battery can be determined.

4. Other active components shall be checked to verify operation within the manufacturer's specifications.

5. At the conclusion of the testing, a report, which shall verify compliance with Section 510.5.3, shall be submitted to the fire code official.

Additional Frequencies. The building owner shall modify or expand the emergency responder radio coverage system at his or her expense in the event frequency changes are required by the FCC or additional frequencies are made available by the FCC. Prior approval of a public safety radio coverage system on previous frequencies does not exempt this section.

Field Testing. Sacramento Fire Department personnel shall have the right to enter onto the property at any reasonable time to conduct field testing to verify the required level of radio coverage.

Frequencies

Any active amplification system installed to meet these requirements shall operate on the following Sacramento Fire Department in repeat analog conventional mode:

TX (Mhz)	853.8750	853.4500	853.1875	852.3500	852.0750	851.6000	853.9000	853.6125
RX (Mhz)	808.8750	808.4500	808.1875	807.3500	807.0750	806.6000	808.9000	808.6125
TX (Mhz)	852.5750	851.8250	851.6250	853.7125	852.7375	852.4625	852.3000	851.7500
RX (Mhz)	807.5750	806.8250	806.6250	808.7125	807.7375	807.4625	807.3000	806.7500
TX (Mhz)	851.3875	853.8000	852.6875	851.8500	851.6750	851.3250	851.0500	853.2625
RX (Mhz)	806.3875	808.8000	807.6875	806.8500	806.6750	806.3250	806.0500	808.2625
TX (Mhz)	852.2500	851.8000	851.6500	851.4375	851.2625			
RX (Mhz)	807.2500	806.8000	806.6500	806.4375	806.2625			